NEW FRESHWATER DIATOM TAXA FROM TROPICAL NORTHERN AUSTRALIA

by DAVID P. THOMAS*

Summary

THOMAS, D. P. (1987) New freshwater diatom taxa from tropical northern Australia. *Trans. R. Soc. S. Aust.* **111**(1), 53-58, 29 May, 1987.

Two new taxa were discovered during a study of freshwater diatoms from the Alligator Rivers region of the Northern Territory. *Achnanthes pseudohungarica* sp. nov. is differentiated from *A. hungarica* by the presence of the horseshoe-shaped area on the raphe valve instead of the rapheless valve. *Eunotia didyma* var. *maxima* f. *tumida* f. nov. varies from the nominate variety by having a consistently smaller length to breadth ratio.

Both taxa appear to have a limited distribution within the Alligator Rivers region with the *Achnanthes* having been found also in the East Finnis River further to the west.

KEY WORDS: *Achnanthes*; *A. pseudohungarica* sp. nov.; *Eunotia*; *E. didyma* var. *maxima* f. *tumida* f. nov.; tropical Australia; freshwater; Bacillariophyta.

Introduction

The two taxa described herein were found during a general survey of the freshwater diatoms of tropical Australia between 1979 and 1981. More than 160 taxa from 32 genera of diatoms were identified from the survey (Thomas 1983).

The climate of this region exhibits a typical tropical alternation between periods of extreme drought and periods of monsoonal rain. These lead to rivers varying from a series of disconnected pools during the "dry" to components of sheets of water, often several metres deep, which cover thousands of square kilometres of Australia's north coast during the "wet". Such extreme environmental variation provides a wide range of growth environments for algae and a greater regional algal diversity compared to the more temperate areas of Australia.

Methods

Field samples were preserved as soon as possible in 10% formalin (usually within an hour). Subsamples were then cleared using 50% nitric acid at 60°C for 12 hours (Crawford 1971). The material was then rinsed of acid by repeated dilutions in distilled water before being transferred to absolute ethanol for storage.

Samples were prepared for light microscopy by evaporating off the ethanol from a suspension of cells placed on a coverglass at 90°C on a hotplate. The coverglass was then mounted on a slide using CAEDEX (MERCK), a synthetic Canada Balsam. The slides were examined and specimens photographed with the aid of a Zeiss PM2 photomicroscope.

* Botany Department, University of Tasmania, GPO Box 252C, Hobart, Tasmania 7001.

For scanning electron microscopy, coverglasses with the dried suspension were mounted onto SEM stubs and sputter coated with gold before being viewed with the aid of a Philips 505 SEM.

Terminology follows that of Anonymous (1975), von Stosch (1975) and Ross *et al.* (1979).

Systematics

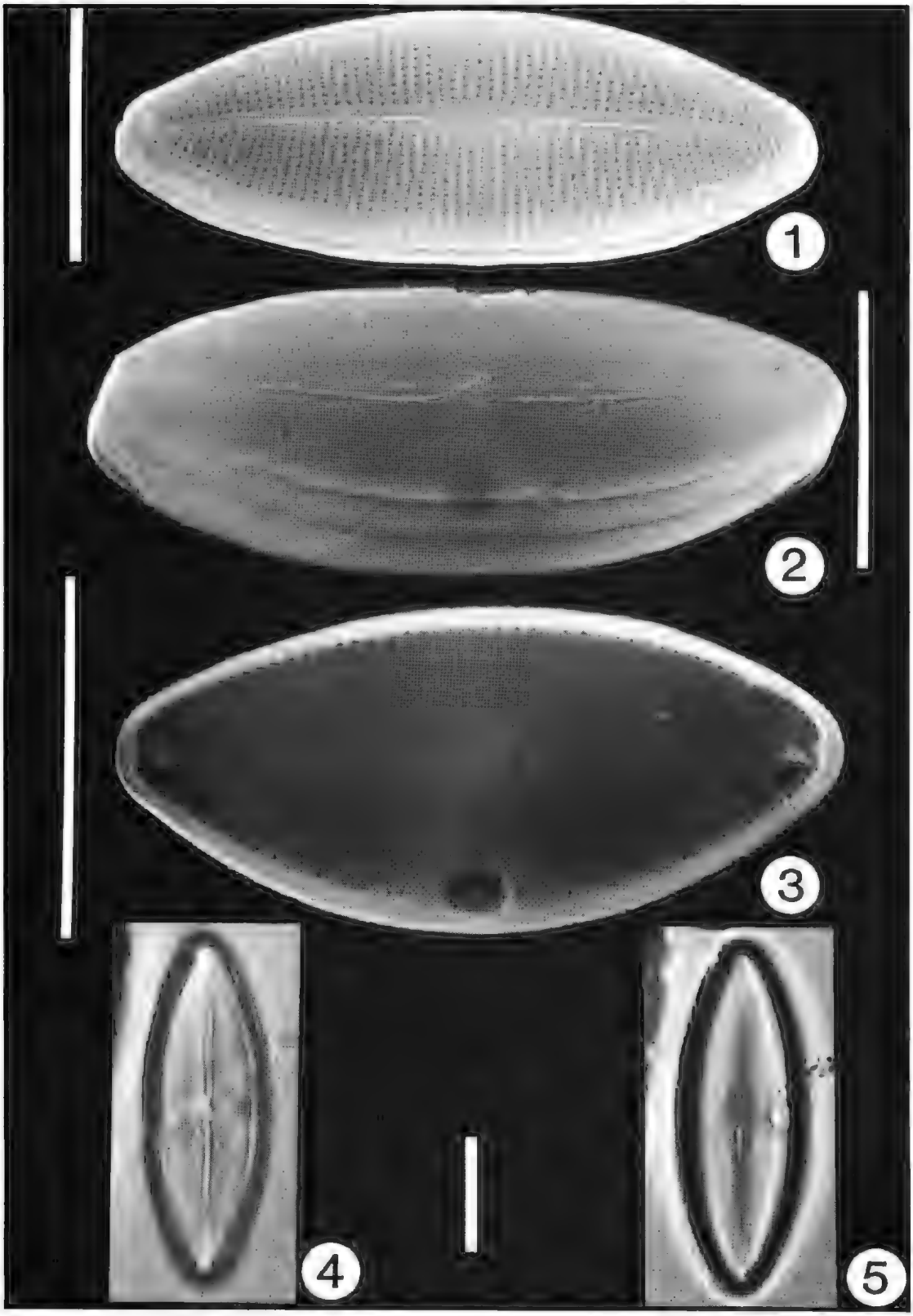
Achnanthes pseudohungarica sp. nov.
FIGS 1-5

Valvae lanceolatae, 14-45 μm longae, 5-13 μm latae. Striae 21-25 in 10 μm, ad centrum parallelae, versus polos leviter radiantes. Areovalva: area axialis circa 1 μm lata, recta, inter polos secus lineam mediam formata, saepe crista angusta longitudinali secus lineam mediam. Raphovalva: area axialis recta, ad polos circa 1 μm latos, versus centrum inflata area 4 μm lata et 7 μm longa formans. Area centralis rhombea, sed area hippocrepica in late uno. Raphe recta, in lineam mediam areae axialis formata, spatio 2 μm longo ad nodulum centralem.

Description: Valves lanceolate, length 14-45 μm and width 5-13 μm. Striae 21-25 in 10 μm, varying from parallel at centre to slightly radiate towards the poles.

Rapheless valve: Axial area approximately 1 μm wide, straight, formed between poles along the centre line, often with a narrow longitudinal ridge formed externally along the centre line of the area.

Raphe valve: Axial area straight, varying from approximately 1 μm wide at the poles and inflating into a central area 4 μm wide and 7 μm long. The central area is rhomboid but with a horseshoe-shaped area on one side. The raphe is straight,


1
2
3
4
5

formed in the central line of the axial area and with a 2 μm gap at the central nodule.

Holotype: D930 (D. P. Thomas' collection, Tasmanian Herbarium—HO 101052), collected by *K. Bishop* on 28.ix.1979 at Magela Falls, N.T. (12°47'12"S, 133°06'07"E) in slightly acid, freshwater splashpool at the base of Falls.

Distribution: Also found in Bowerbird, Gulungul and Nankeen water holes from the Magela Creek and from Rum Jungle on the East Finnis River, Northern Territory (see Thomas 1983).

With the aid of the scanning electron microscope (Fig. 2) it is evident that the cingulum is composed of the valvocopulae alone and that these are open and apparently unstructured.

Eunotia didyma var. ***maxima*** f. ***tumida*** f. nov.
FIGS 6-8

Valvae formam maximam *similes, sed abbreviatae et plus inflatae, polis obtusioribus (50° vs 42°) et ratione longitudinis versus latitudinem reducta (2.4 vs 3.7). Valvae 76–110 μm longae et 38–44 μm latae.*

Description: Valves similar to *E. didyma* var. *maxima* Hustedt 1913 (Fig. 6) but shorter and more inflated with less acute poles (50° *vs* 42°) and a reduced length to breadth ratio (*ca.* 2.4 *vs* 3.7). Valves range from 76–110 μm long and 38–44 μm wide.

Holotype: D868 (D. P. Thomas' collection, Tasmanian Herbarium—HO 101051) collected by *D. Thomas* on 19.viii.1979 at Jim Jim Falls, N.T. (13°16'34"S, 132°50'12"E) in slightly acid, freshwater splashpool at the base of Falls.

Distribution: Has not been observed outside the type locality.

Scanning electron microscopy (Fig. 8) shows that the valve is ornamented with irregularly arranged, brief, broad based spines. The cingulum is composed of a valvocopula and up to three pleurae with all elements open. The valvocopula has fine vertical striae (ca. 30 in 10 μm) while the pleurae appear to be unstructured.

Discussion

Achnanthes pseudohungarica is similar to *A. hungarica* (Grunow 1863) Grunow *in* Cleve & Grunow (1880) except that the horseshoe-shaped area is formed on the raphe valve of *A. pseudohungarica* and on the rapheless valve of *A. hungarica.* This is the same feature which was used to differentiate *A. pseudolanceolata* Manguin (1962) (*non* Hustedt 1952) and *A. lanceolata* (Brébisson *in* Kützing 1849) Grunow *in* Cleve & Grunow (1880). In addition, *A. hungarica* has a lower strial density (16–22 in 10 μm *vs* 22–25 in 10 μm) and *A. pseudohungarica* does not have a narrow stauros on either valve.

The absence of *A. hungarica* from this region combined with the wide distribution of *A. pseudohungarica* make in unlikely that this is just a mutant variant of the latter and can be considered a stable species. On the other hand, the very narrow distribution of *Eunotia didyma* var. *maxima* f. *tumida* and the presence of its nominate variety in the same and adjacent water holes makes me very reluctant to raise it to a higher status than that of forma.

Acknowledgments

Grateful thanks are extended to Dr Peter Tyler and the members of the Botany Department, University of Tasmania who participated in the field studies upon which this paper is based and made odd collections in out of the way places. The same can be said of Mr Keith Bishop from the N.S.W. State Fisheries who collected the type sample of *A. pseudohungarica.* The Latin diagnoses were provided by Dr Tony Orchard, Director of the Tasmanian Herbarium and the manuscript was critically read by Dr Tyler. This work was supported by a grant from the Office of the Supervising Scientist East Alligator Rivers Region and the use of their facilities at Jabiru.

References

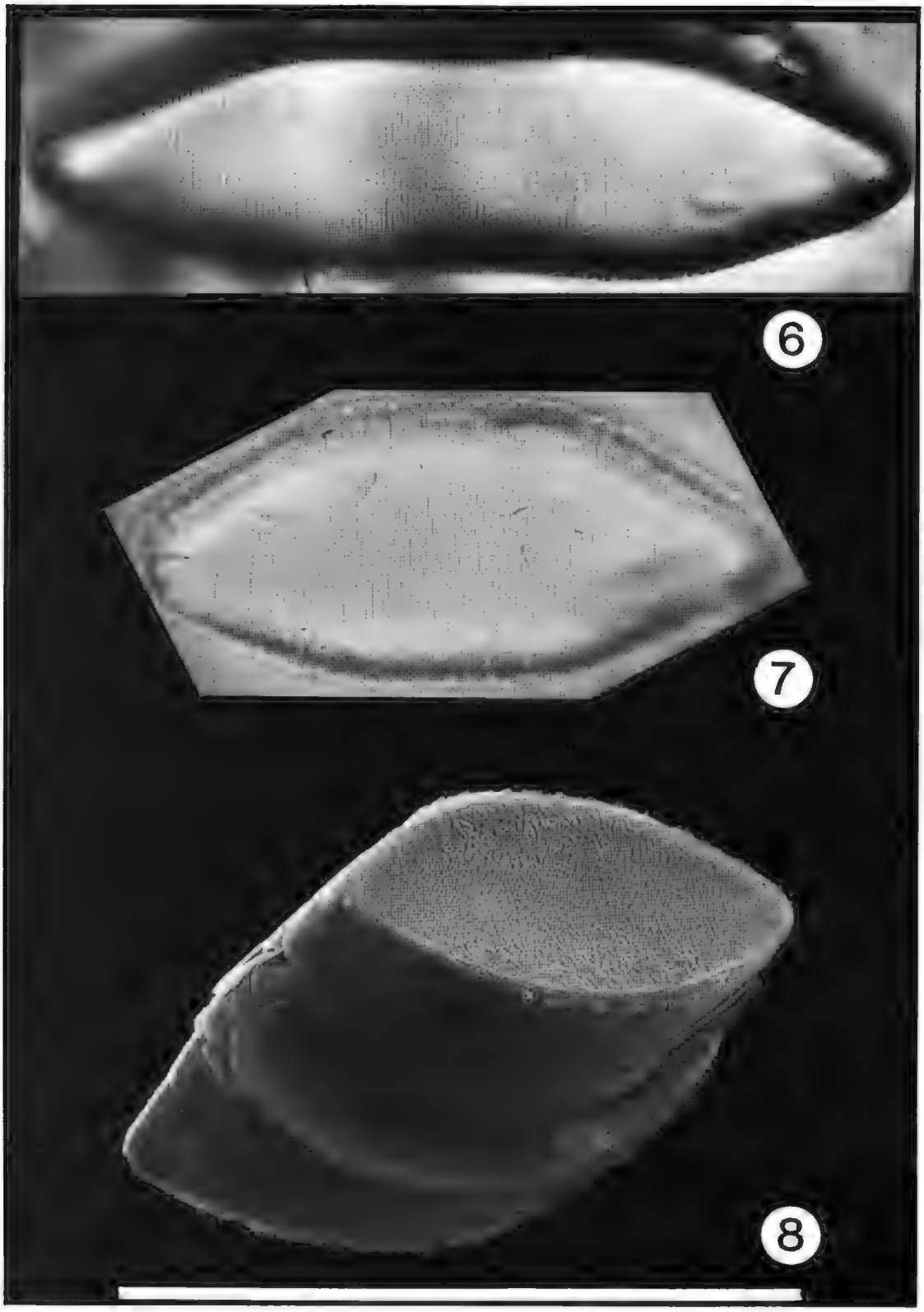
ANONYMOUS (1975) Proposals for a standardization of diatom terminology and diagnoses. *Nova Hedwigia, Beih.* **53**, 523-554.

CLEVE, P. T. & GRUNOW, A. (1880) Beiträge zur Kenntniss der arctischen Diatomeen. *Kongl. Svenska Vetens.-Akad. Handl.* **17**(2), 1-121.

CRAWFORD, R. M. (1971) The fine structure of the frustule of *Melosira varians* C. A. Agardh. *Br. phycol. J.* **6**, 175-186.

GRUNOW, A. (1863) Über einige neue und ungenügend bekannte Arten und Gattungen von Diatomaceen.

Figs 1-5. *Achnanthes pseudohungarica* sp. nov. 1. SEM of external surface of the rapheless valve. 2. SEM of external surface of the raphe valve showing lack of external opening of the horseshoe shaped area and the valvocopula. 3. SEM of internal surface of the raphe valve showing the internal opening of the horseshoe shaped area. 4. LM of the rapheless valve (Holotype slide HO 101052). 5. LM of raphe valve (Holotype slide HO 101052). All scales 10 μm.


6
7
8

Zweite Folge. *Verhandlungen der kais.-königl. zool.-bot. Gesell. Wien* **13**, 137-162, Plates 13-14.

HUSTEDT, F. (1913) *In* A. Schmidt, *et al.* (1874-1959) "Atlas der Diatomaceen-kunde". Plates 285-288. (R. Riesland, Leipzig).

——— (1952) Neue und wenig bekannte Diatomeen. IV. *Bot. Not.* **4**, 366-410.

KÜTZING, F. T. (1849) "Species Algarum". 922 pp. (F. A. Brockhaus, Lipsiae).

MANGUIN, E. (1962) Contribution à la Conaissance de la Flore Diatomique de la Nouvelle-Calédonie. *Mém. Mus. Nat. Hist. Nat. nouv. sér., sér. B, Bot.* **12**(1), 1-40.

ROSS, R., COX, E. J., KARAYEVA, N. I., MANN, D. G., PADDOCK, T. B. B., SIMONSEN, R. & SIMS, P. A. (1979) An amended terminology for the siliceous components of the diatom cell. *Nova Hedwigia, Beih.* **64**, 513-533.

STOSCH, H. A. von (1975) An amended terminology of the diatom girdle. *Nova Hedwigia, Beih.* **53**, 1-28.

THOMAS, D. P. (1983) A limnological survey of the Alligator Rivers Region, Northern Territory. 1. Diatoms (Bacillariophyceae) of the region. *Supervising Scientist for the Alligator Rivers Region, Research Report* **3**, 1-139.

Figs 6–8, 6. LM of *Eunotia didyma* var. *maxima* from sample no. 868. *Eunotia didyma* var. *maxima* f. *tumida* f. nov. 7. LM of valve (Holotype slide HQ 101051), 8. Oblique SEM of dividing frustule showing raphe, girdle structure and marginal spines. Scale 100 μm.

FEEDING AND GROWTH OF GOLDEN PERCH LARVAE AND FRY (MACQUARIA AMBZGUA RICHARDSON)

*BY P. T. ARUMUGAM & M. C. GEDDES**

Summary

Golden perch larvae were stocked into an earthen pond and grew exponentially from a mean standard length 4.5 mm (dry weight 0.16 mg) to a mean of 31 mm (165 mg) in 46 days from 12 November until 28 December, 1984. The growth coefficients were 0.04 mm mm^{-1} day^{-1} for length and 0.15 mg mg^{-1} day^{-1} for weight. The mouth gape was related to length. At first feed the type and size of prey was restricted by poor swimming and pursuit abilities and small mouth gape. Larvae and fry greater than 10 mm standard length were able to pursue a wide range of zooplankters but feeding was limited by mouth gape. The daily food consumption of larvae and fry increased from 33 to 5600 µg dry weight per day. Because of the relatively small size of golden perch larvae at first feed, survival is dependent upon a high density of appropriate sized zooplankters.

KEY WORDS: Fish, larvae, fry, *Macquaria arnbigua*, feeding, growth, mouth gape.